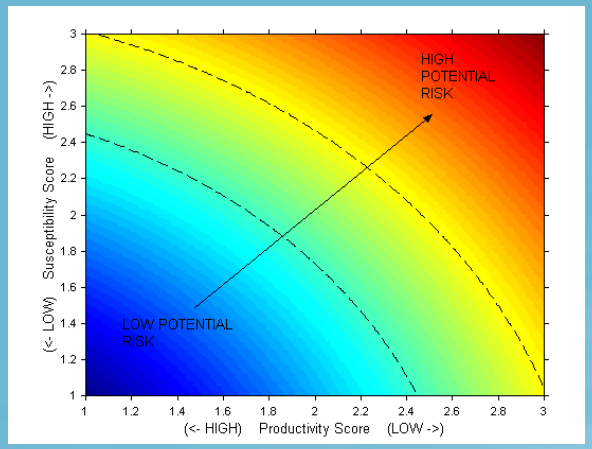
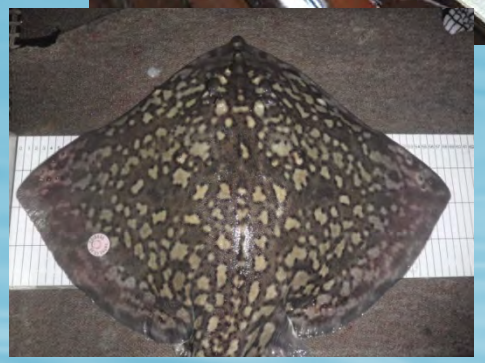
Latest Scientific Advice on Skates and Rays

Sophy McCully and Jim Ellis





Seafish Skates and Rays Group Meeting
Friends House, London
8 October 2013

Cefas

Management Concerns

- Skates are vulnerable to capture from an early age
- Slow growing and late maturing
- Fecundity is low
- Aggregating nature
- Capture in mixed fisheries
- Many ecologically important areas unknown
- Some skate species have:
  - Disappeared from some areas (e.g. white skate)
  - Retracted distributions (e.g. thornback ray)
  - Patchy distributions (e.g. undulate ray)

Cefas

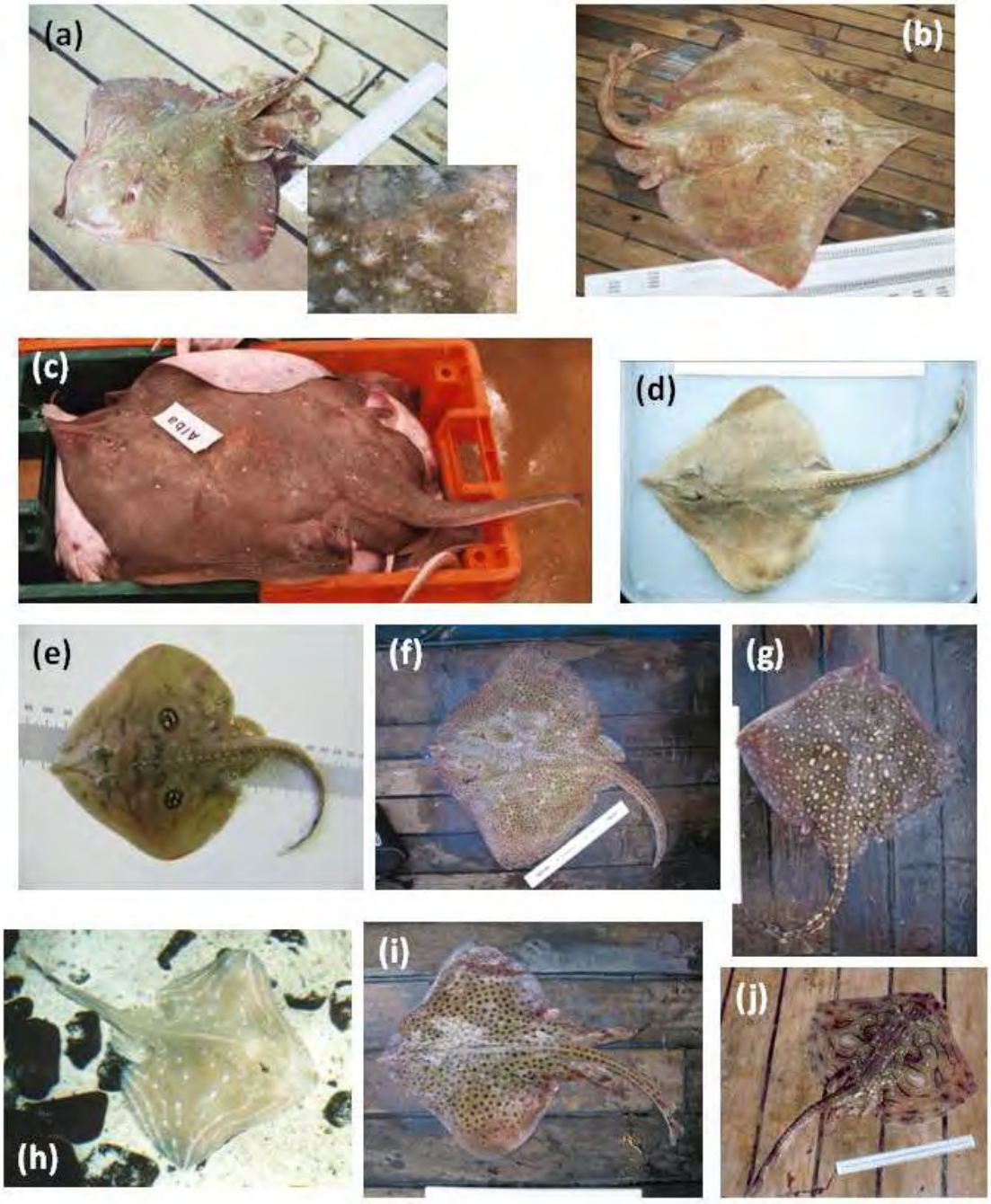
	Scientific name and authority	Common name
1	Amblyraja hyperborea (Collett, 1879)	Arctic skate
2	Amblyraja jenseni (Bigelow & Schroeder, 1950)	Short-tail skate
*3	Amblyraja radiata (Donovan, 1808)	Starry ray
4	Bathyraja pallida (Forster, 1967)	Pale ray
5	Bathyraja richardsoni (Garrick, 1961)	Richardson's ray
6	Bathyraja spinicauda (Jensen, 1914)	Spinetail ray
-	Dipturus batis (Linnaeus, 1758)	Common skate
*7	= Dipturus cf. flossada	= Blue skate
*8	= Dipturus cf. intermedia	= Flapper skate
9	Dipturus linteus (Fries, 1838)	Sailray
10	Dipturus nidarosiensis (Storm, 1881)	Norwegian skate
*11	Dipturus oxyrinchus (Linnaeus, 1758)	Long-nosed skate
*12	Leucoraja circularis (Couch, 1838)	Sandy ray
*13	Leucoraja fullonica (Linnaeus, 1758)	Shagreen ray
*14	Leucoraja naevus (Müller & Henle, 1841)	Cuckoo ray
15	Malacoraja kreffti (Stehmann, 1977)	Krefft's ray
16	Malacoraja spinacidermis (Barnard, 1923)	Soft skate
17	Neoraja caerulea (Stehmann, 1976)	Blue ray
*18	Raja brachyura Lafont, 1873	Blonde ray
*19	Raja clavata Linnaeus, 1758	Thornback ray
*20	Raja microocellata Montagu, 1818	Small-eyed ray
*21	Raja montagui Fowler, 1910	Spotted ray
*22	Raja undulata Lacepède, 1802	Undulate ray
23	Rajella bathyphila (Holt & Byrne, 1908)	Deepwater ray
24	Rajella bigelowi (Stehmann, 1978)	Bigelow's ray
*25	Rajella fyllae (Lütken, 1887)	Round skate
26	Rajella kukujevi (Dolganov, 1985)	Mid-Atlantic skate
*27	Rostroraja alba (Lacepède, 1803)	White skate

Taxonomic list of skates (Rajidae) occurring around the British Isles, including adjacent deep-water habitats in the North-east Atlantic.

Those species that may be encountered on the continental shelf are highlighted with an asterisk.

Ellis *et al*. (2012b)

Cefas



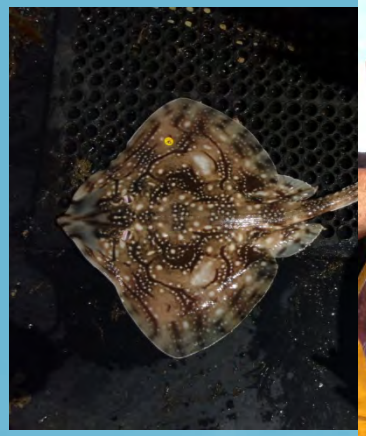
Main skate species occurring on the continental shelf of the United Kingdom, showing:

(a) starry ray *Amblyraja radiata*,
(b) common skate *Dipturus* cf. *flossada,*
(c) sandy ray *Leucoraja circularis,*
(d) shagreen ray *L. fullonica,*
(e) cuckoo ray *L. naevus,*
(f) blonde ray *Raja brachyura,*
(g) thornback ray *R. clavata,*
(h) small-eyed ray *R. microocellata,*
(i) spotted ray *R. montagui* and
(j) undulate ray *R. undulata.*

Ellis *et al*. (2012b)

Cefas

Exploitation v. Conservation



	2008	2009	2010	2011	2012
Quantity ('000 tonnes)	2.9	2.5	2.7	2.7	2.6
Value (£ million)	3.3	3.2	3.8	3.9	3.4

Cefas

Summary of recent issues

- Alternative management options!
- Species ID issues
- Misreporting of prohibited species

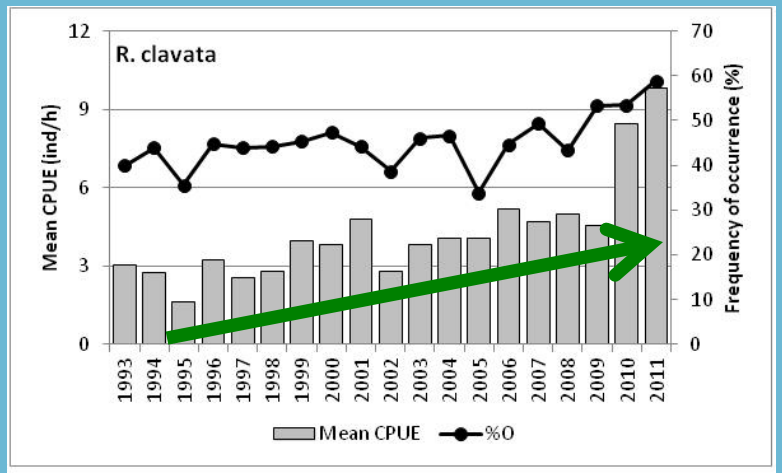
  (levels unknown, but some suggestion that species reported as congeners or at family level)
- Discard survival

  (including in relation to CFP reform)

Cefas

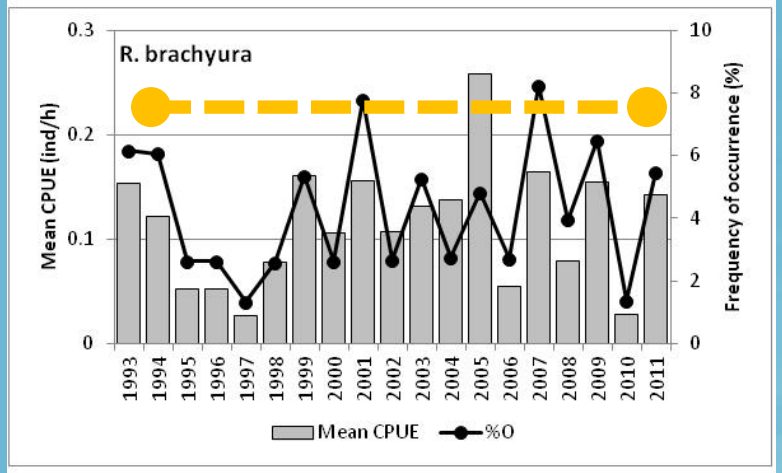
Survey Trends

- Gear used is often not ideal, but they can provide us with a **signal**.
- They are our longest source of **species specific** time series data
- Ok for smaller bodied skates inshore.
- Larger bodied and deeperwater skates are not well represented.
- Issues with timing of surveys and survey areas.
- But what they do cover are……



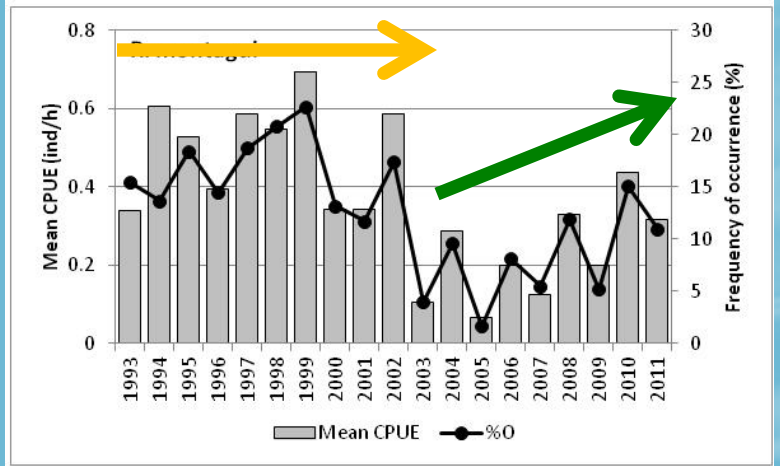
Thornback ray

Catch rates in trawl surveys increasing



Blonde ray

Catch rates in trawl surveys low, variable, erratic. Uncertain trend



Spotted ray

Catch rates in trawl surveys increasing in recent years

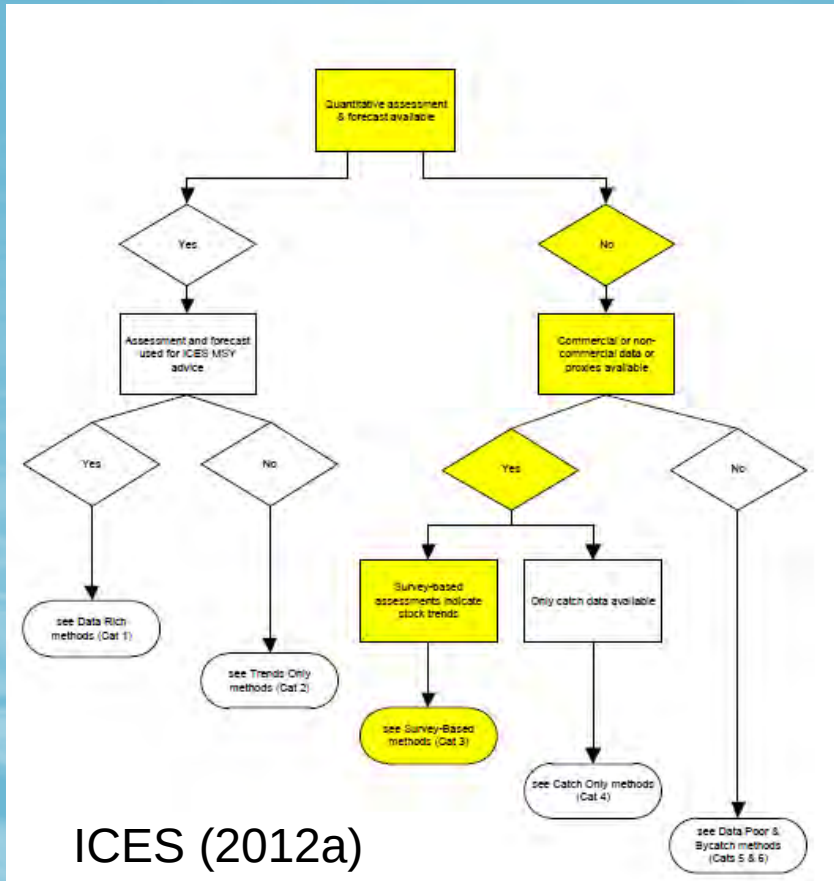
Cefas

Data Limited Stocks in ICES

- Of the 200 stocks for which ICES provides advice, ICES determined that 122 do not have population estimates from which catch options can be derived using the existing MSY framework (ICES, 2012a).

• A 6-level framework of varying levels of data deficiency was drawn up to allow qualitative assessment of many species

• Before this framework was initiated, most elasmobranchs were ‘no advice’



ICES (2012a)

Category 1; data-rich stocks (quantitative assessments)

Category 2; stocks with analytical assessments - forecasts that are treated qualitatively

Category 3; stocks for which survey-based assessments indicate trends

3.1: For extremely low biomass, recovery plan & zero catch possibly advised
(Common skate complex Celtic Sea)

3.2. If there are survey data on abundance (e.g. cpue over time), but there is no survey-based proxy for MSY Btrigger and F values or proxies are not known
(North Sea: Thornback, Cuckoo, Spotted & Starry ray)
(Celtic Sea: Thornback, Cuckoo, Spotted ray)

Category 4; stocks for which reliable catch data are available

Category 5; data-poor stocks (only landings data)

5.2. If there is no indication of where F is relative to proxies and no marked positive trends in stock indicators
(Celtic Sea: Blonde, Sandy, Shagreen ray)
(North Sea: Blonde and 'Other' rays)

Category 6; negligible landings stocks and stocks caught in minor amounts as bycatch

6.2: If there is no indication of where F is relative to proxies and no marked positive trends in stock indicators
(North Sea: Smalleyed ray)

6.3: Method 6.3. If catches have declined significantly over a period of time and this is considered to be representative of a substantial reduction in biomass, a re-covery plan and possibly zero catch is advised
(Common skate in North Sea, Undulate ray and 'Other rays' Celtic Sea)

Cefas

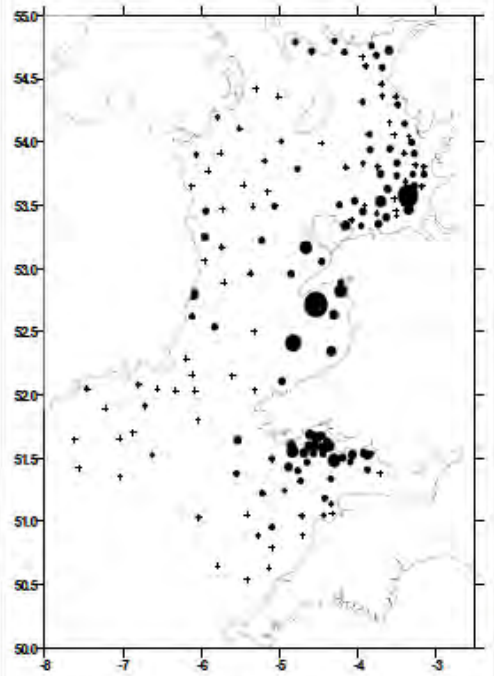
18.S13: *Raja clavata*

Survey area: VIIaf

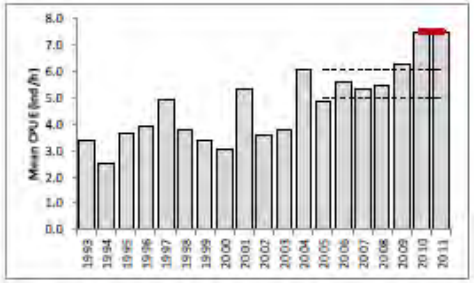
Survey acronym: UK (E&W) VIIAF BTS

Survey gear: 4 m Beam trawl with chain mat

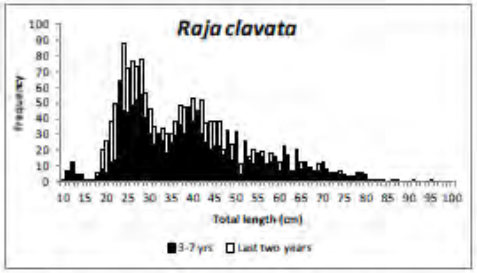
Survey data used



Distribution and relative abundance of *Raja clavata* in survey area (from Ellis, 2010)



Mean cpue of VIIaf *Raja clavata*. Dashed lines give mean annual cpue for 2005–2009; red line shows mean annual cpue for 2010–2011.



Length distribution of *Raja clavata* in beam trawl survey for the periods 2005–2009 and 2010–2011

Distribution: Widespread in survey area, especially in Solway Firth, Liverpool Bay, Cardigan Bay and Bristol Channel.	✓
Catch rates: Catch rates increasing.	↗
Size distribution: Larger individuals only encountered infrequently, which may be related to a low gear selectivity for larger fish.	?
Overall status: Although there are no indications of recent declines in the health of the stock, this is one of the main commercial species.	✓
Exploitation: It is considered that current exploitation is appropriate for the stock.	✓

Advice for 2013 and 2014, based on survey trend of average cpue over last 2 years, against average of previous 5 years (dashed lines indicate +/- 1s.d.

Here ↑ in survey catch rates ~35% = +20% catch advised

ICES (2013)

Cefas

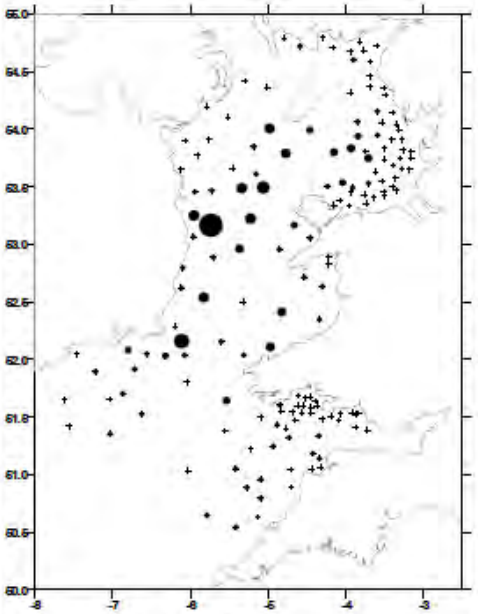
18.516: *Leucoraja naevus*

Survey area: VIIa

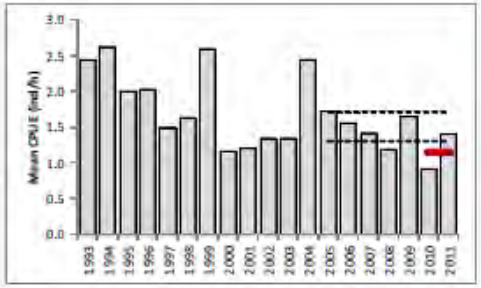
Survey acronym: UK (E&W) VIIAF BTS

Survey gear: 4 m Beam trawl with chain mat

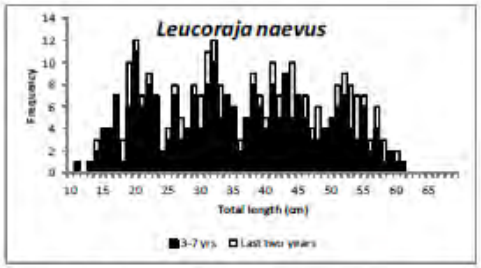
Survey data used: Stations in Irish Sea only



Distribution and relative abundance of *Leucoraja naevus* in survey area (from Ellis, 2010)



Mean cpue of VIIa *Leucoraja naevus*. Dashed lines give mean annual cpue for 2005–2009; red line shows mean annual cpue for 2010–2011.



Length distribution of *Leucoraja naevus* in beam trawl survey for the periods 2005–2009 and 2010–2011

Distribution: Widespread in deeper waters of survey area, especially in St George's Channel. Degree of connectivity with Celtic Sea and NW Scotland unclear.	✓
Catch rates: Mean catch rate from last two years had decreased from preceding five years.	↘
Size distribution: Length range encountered does not appear to have changed for this small-bodied species.	✓
Overall status: Although recent catch rates appear to have declined, recent catch rates are similar to that observed from 2000–2003. This small-bodied species is not as commercially valuable as larger species (*e.g. R. brachyura* and *R. clavata*).	?
Exploitation: Recent catch rates have shown a decline, but there are no other biological indications of overexploitation. It is unclear as to whether current exploitation is appropriate for the stock.	?

UK (E&W) VIIaf BTS: Abundance ↓ ~23% in 2010-2011 from previous 5-year average

The French EVHOE Q4 :↑ in biomass ~12%

The Spanish Porcupine survey: both abundance and biomass ↓ to low levels.

ICES therefore recommends a 20% decrease in catches in relation to the last three years' average landings.

As exploitation is unknown, ICES advises that catches should decrease by a further 20% as a precautionary buffer.

Results in a decrease of 36% in catches

ICES (2013)

Cefas

Main Skate and Ray Species: North Sea

Overall TAC 2700 t

Species	Stock Unit	2013/2014 Advised % change in catch	Fishing Mortality	Spawning Stock Biomass
Thornback ray	IV, VIId, IIIa	+20%	?	↗
Spotted ray	IV, VIId, IIIa	+20%	?	↗
Cuckoo ray	IV, VIId, IIIa	+20%	?	↗
Blonde ray	VIId, e	-20%	?	?
Small-eyed ray	IV, VIId, Iia	-20%	?	?
Undulate ray	VIId, e	No target fishery	?	?
Common skate complex	IV, VIId, IIIa	0	?	✗
Starry ray	IV, VIId, IIIa	-36%	?	↘
Other species*		-20%	?	?

General advice: '*No TAC + species-specific measures*'

**including: Dipturus linteus, Dipturus nidarosiensis, Dipturus oxyrhinchus, Leucoraja circularis, and Leucoraja fullonica*

Cefas

UK (E, W and NI) Summary Skate 2012 Catch Data – North Sea

	ICES Area IV	
	Weight (t)	**% national catch**
Thornback ray	**316.2**	**88.9%**
Spotted ray	**17.6**	**5.0%**
Blonde ray	**14.3**	**4.0%**
Cuckoo ray	**2.1**	**0.6%**
Common skate complex	**0.2**	**0.1%**
Starry ray	**0.1**	**0.0%**
Smalleyed ray	**0**	**0.0%**
Skates and rays	5.2	1.5%
Total	355.8	100% (98.5% to species)

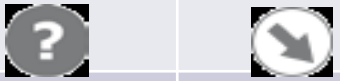
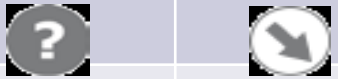
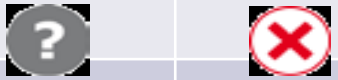
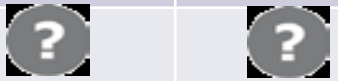
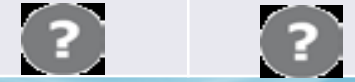
Cefas

UK (E, W and NI) Summary Skate 2012 Catch Data – English Channel

	ICES Area VIId	
	Weight (t)	**% national catch**
Thornback ray	**117.9**	**70.9%**
Blonde ray	**36.7**	**22.1%**
Spotted ray	**6.0**	**3.6%**
Smalleyed ray	**2.3**	**1.4%**
Starry ray	**0.0**	**0.0%**
Common skate complex	**0.2**	**0.1%**
Long nosed skate	**0.1**	**0.1%**
Skates and rays	3.0	1.8%
Total	166.2	100% (98.2% to species)

Cefas

Main Skate and Ray Species: Celtic Sea and west of Scotland

Species	Stock Unit		2013/2014 Advised % change in catch		Fishing Mortality	Spawning Stock Biomass
Thornback ray	VI	VIIa,f,g	+20%	+20%		
Spotted ray	VI	VIIa,f,g	-23%	+20%		
Blonde ray	VI	VIIa,f,g	-20%	-20%		
Cuckoo ray	VI, VII		-36%			
Small-eyed ray	VIIf,g		-36%			
Undulate ray	VIIj		D			
Common skate complex	VI, VII		D			
Sandy ray	VI, VII		-20%			
Shagreen ray	VI, VII		-20%			
Other species*	VI, VII		-20%			

General advice: '*No TAC + species-specific measures*'

D – Depleted stock, no targeted fishery, minimise bycatch

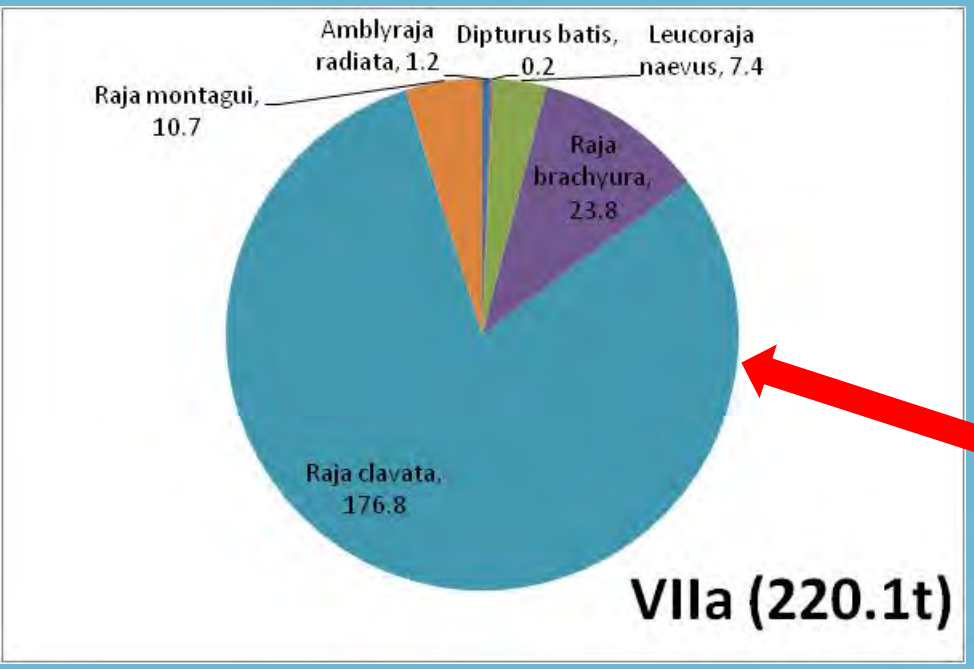
* including: Amblyraja radiata, Dipturus nidarosiensis, Dipturus oxyrhinchus

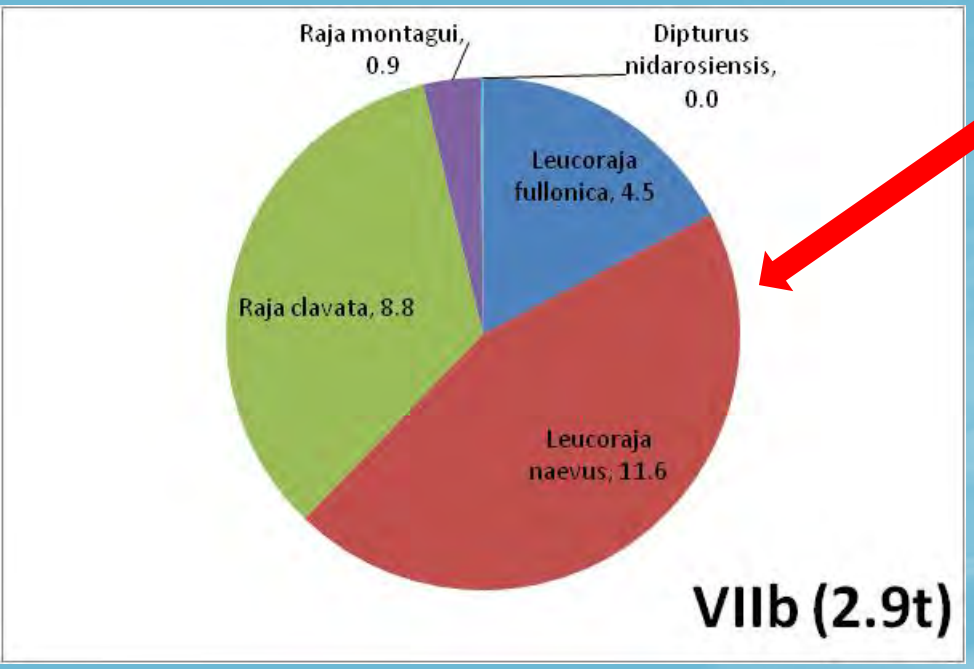
Cefas

UK (E, W and NI) Summary Skate Catch Data – Celtic Seas

	ICES Area VIa		ICES Area VIb	
	Weight (t)	**% national catch**	**Weight (t)**	**% national catch**
Amblyraja radiata	0.0	5.6		
Leucoraja naevus	0.0	0.8		
Raja brachyura	**0.1**	**46.4**	**0.3**	**100**
Raja clavata	0.1	47.2		
Total	0.3	100	0.3	100

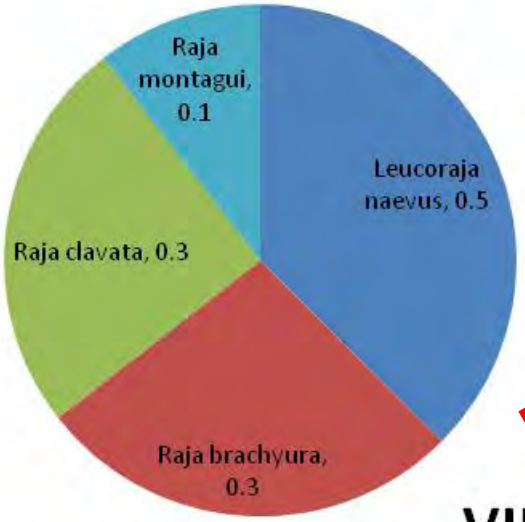
Cefas


Amblyraja radiata, 1.2
Dipturus batis, 0.2
Leucoraja naevus, 7.4
Raja montagui, 10.7
Raja brachyura, 23.8
Raja clavata, 176.8
VIIa (220.1t)

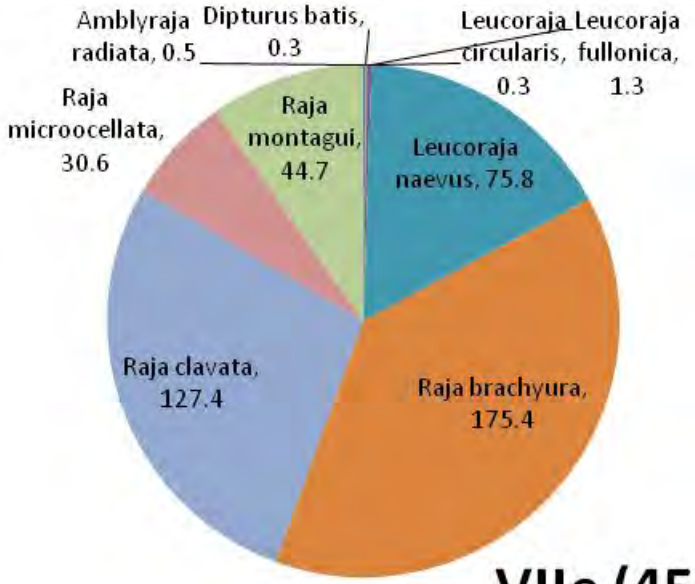

Raja montagui, 0.9
Dipturus nidarosiensis, 0.0
Leucoraja fullonica, 4.5
Raja clavata, 8.8
Leucoraja naevus, 11.6
VIIb (2.9t)


N
Vb1b
Vb2
XIIa2
Vb1a
60°N
IVa
VIb1
VIb2
VIa
IVb
VIIa
VIIc1
VIIc2
VIIb
IVc
VIIg
VIIk2
VIIj2
VIIf
VIId
50°N
VIIk1
VIIe
VIIh
VIIj1
VIIId1
VIIIa
VIIIe1
VIIId2
VIIIb
VIIIe2
VIIIc
40°N
IXb1
IXb2
IXa

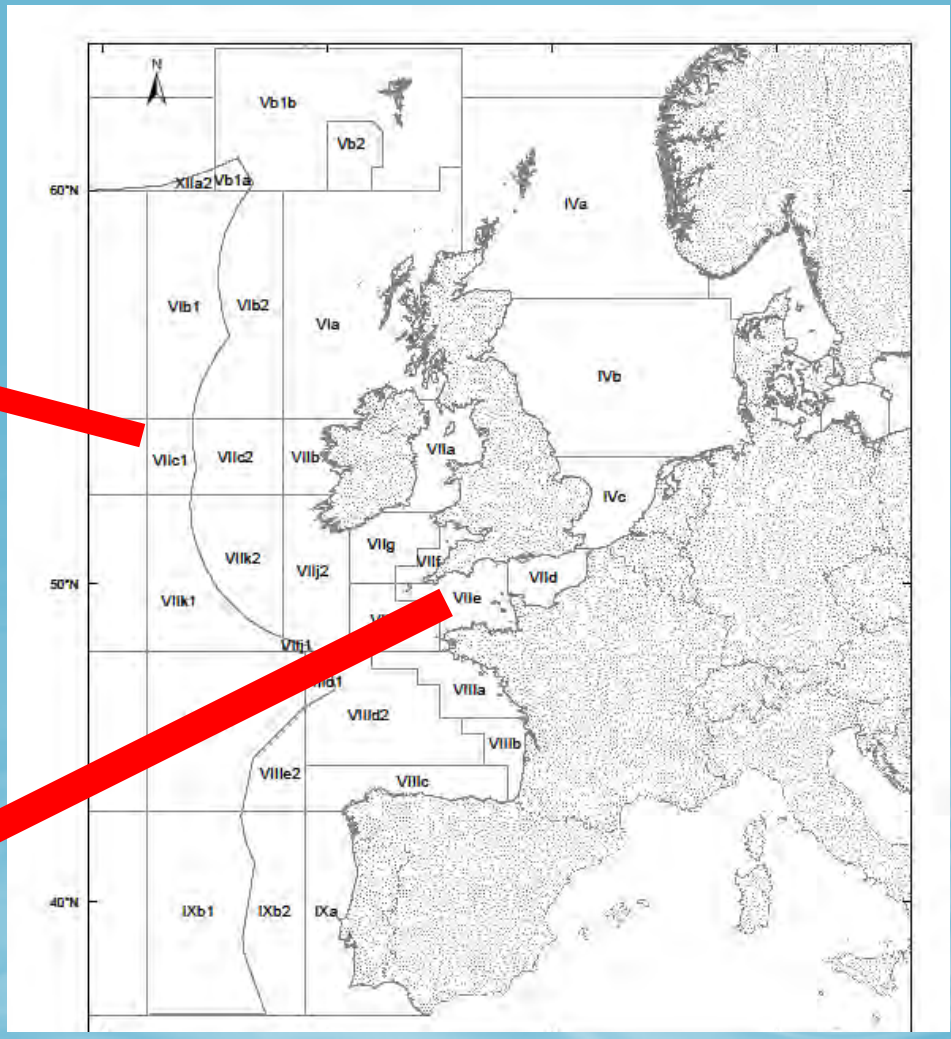
Cefas



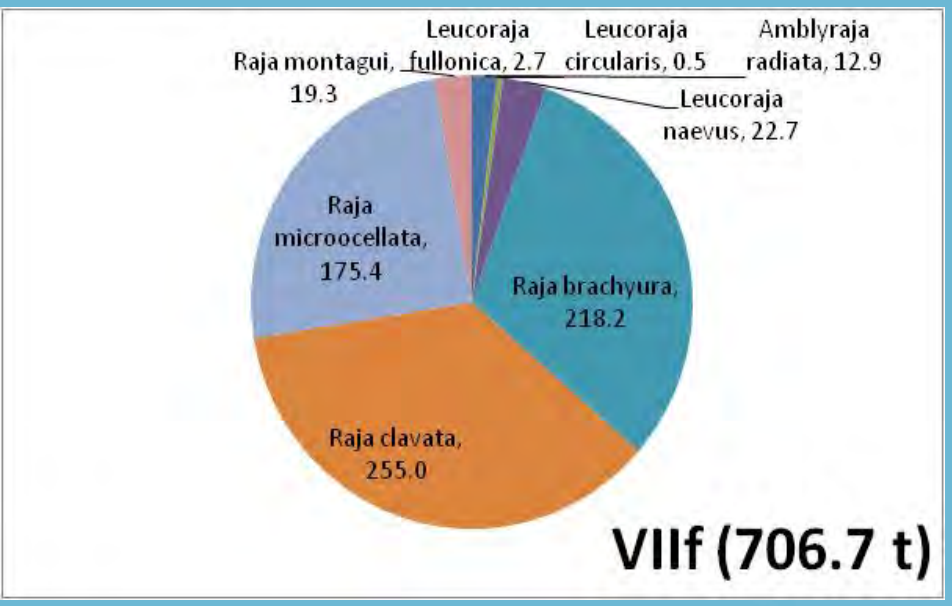
VIIc (1.2 t)

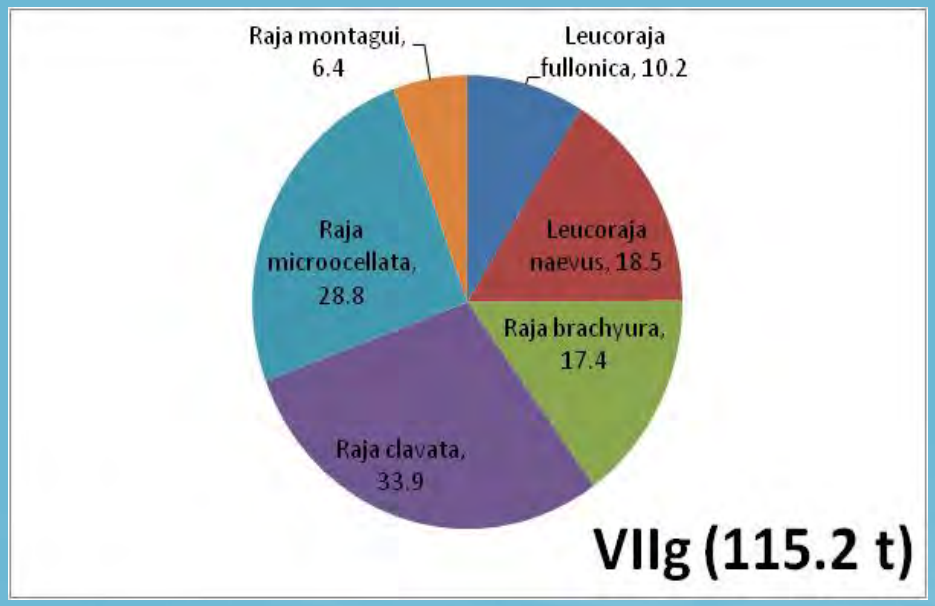


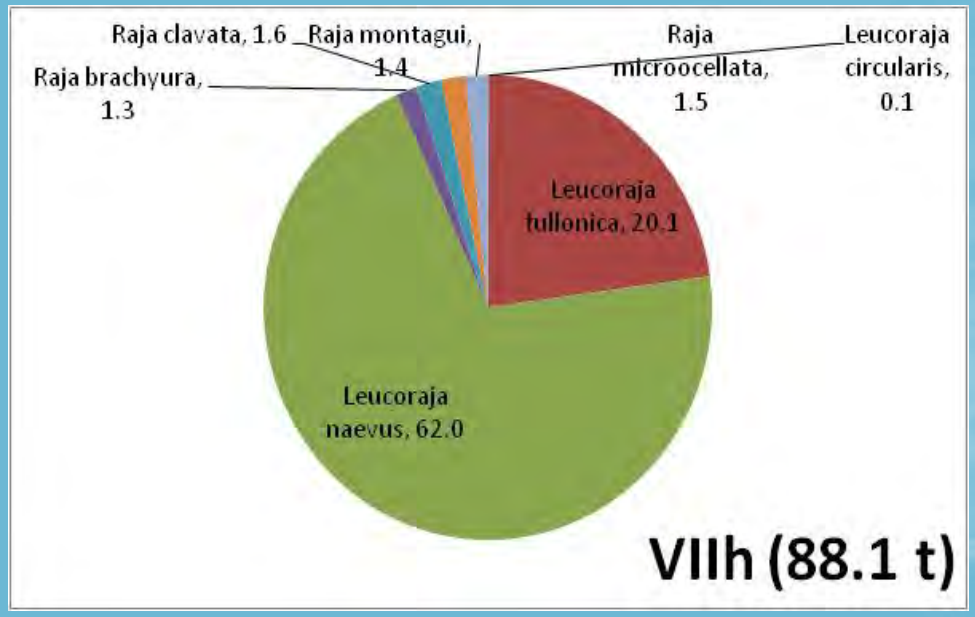
VIIe (456.2 t)

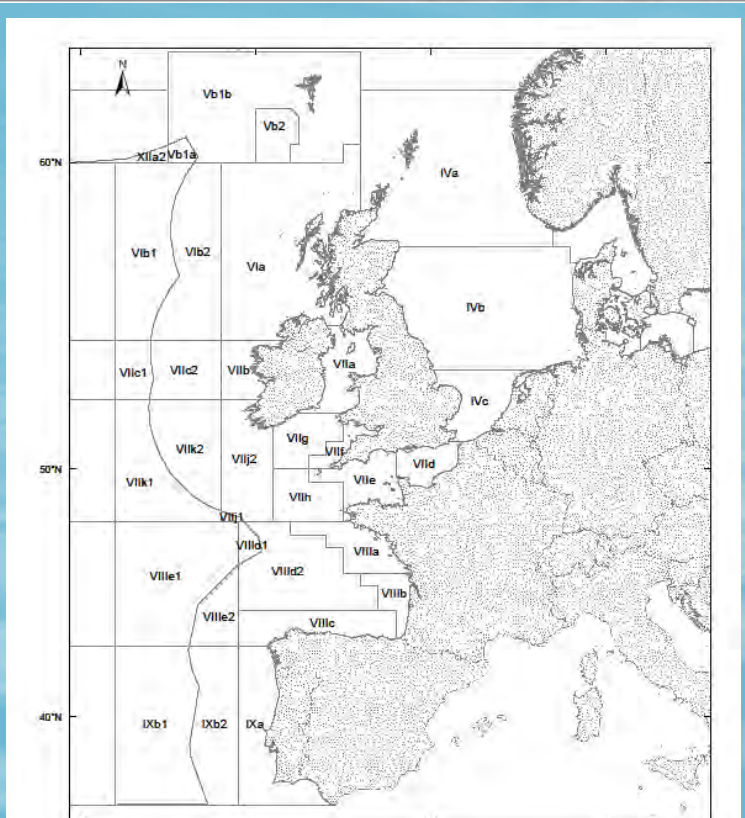


Cefas


Leucoraja fullonica, 2.7
Leucoraja circularis, 0.5
Amblyraja radiata, 12.9
Raja montagui, 19.3
Leucoraja naevus, 22.7
Raja microocellata, 175.4
Raja brachyura, 218.2
Raja clavata, 255.0
VIIf (706.7 t)

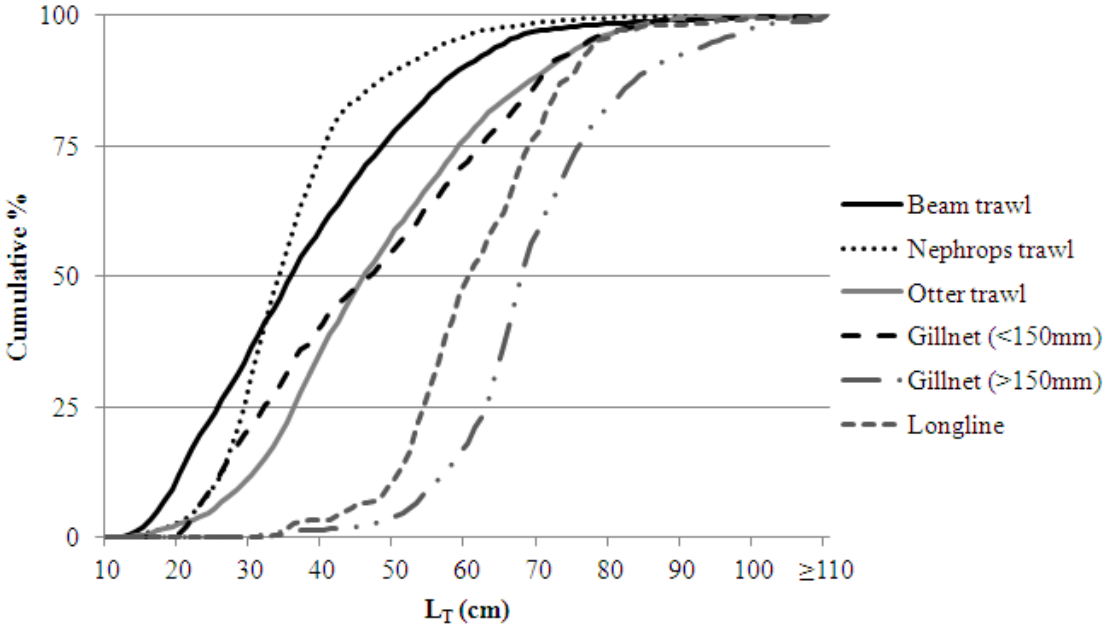

Raja montagui, 6.4
Leucoraja fullonica, 10.2
Raja microocellata, 28.8
Leucoraja naevus, 18.5
Raja brachyura, 17.4
Raja clavata, 33.9
VIIg (115.2 t)


Raja clavata, 1.6
Raja montagui, 1.4
Raja brachyura, 1.3
Raja microocellata, 1.5
Leucoraja circularis, 0.1
Leucoraja fullonica, 20.1
Leucoraja naevus, 62.0
VIIh (88.1 t)


N
Vb1b
Vb2
XIIa2
Vb1a
60°N
IVa
VIb1
VIb2
VIa
IVb
VIIc1
VIIc2
VIIb1
VIIa
IVc
VIIg
VIIf
VIIk2
VIIj2
VIId
50°N
VIIk1
VIIe
VIIh
VIIj1
VIIId1
VIIIa
VIIIe1
VIIId2
VIIIb
VIIIe2
VIIIc
40°N
IXb1
IXb2
IXa

Skate Size Frequency at Capture by Gear

Beam trawlers caught more small skates than the other gears, followed by small-mesh gillnets (90–150 mm mesh), otter and *Nephrops* trawls. Larger gillnets (200–256 mm mesh) caught proportionally more large skates.



Information from discard observer programmes indicted that skates <30 cm in length were usually discarded, with about half the skates discarded at a length of ca. 50 cm. Skates larger than 60 cm were typically retained.

Cumulative size frequency of all skates (Rajidae) caught by broad category of fishing gear, as observed in the CEFAS observer programme (2002–2010) (Ellis *et al*. 2012b). Also see Silva *et al*. (2012) for a detailed breakdown of skate and ray discard patterns by gear and area.

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Discard Survival Studies

- **Longline**: Skates had a high short-term discard survival but for those with overnight soak times, the damage to the mouth and jaws may compromise longer-term survival.

- **Inshore Gillnets**: Skates had a high short-term discard survival with short soak times. Short-term survivorship for skates caught in gillnets deployed overnight was ~98%, although this decreased to about 88% for soak times of 43–48 hours.

- **Offshore Gillnets**: Higher mortality than inshore, although 93% still survived overnight soaks, and 92% survived capture in nets set for 36–60 h.

- **Otter Trawl**: Skates in tows of <4 h usually survived capture, depending on the weight and contents of the cod-end.

- **Beam Trawl**: About 50% of skates survived capture by beam trawl, with higher mortality observed for the smallest size category.

- All mortality dependent upon other factors including the tidal flow in the area, scavenging isopods etc..Further studies are needed.

(see Ellis *et al*. 2012b for further information)

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Taxonomic Confusion / ID Issues

Thornback ray

Starry ray or Thorny skate

Standardised names also an issue:

- Smalleyed ray (*Raja microocellata*)
- Sandy ray (*Leucoraja circularis*)
- In south-west, smalleyed ray also called sandy ray

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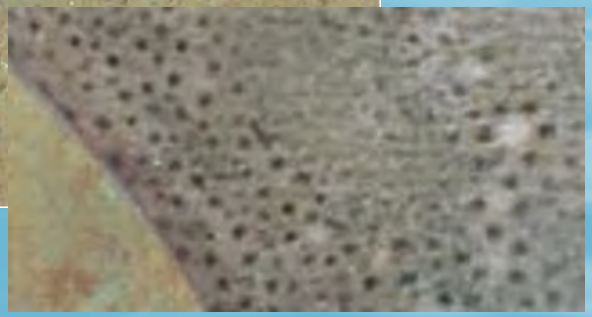
Spotted and Blonde ray often confused

Spotted ray faster growing, more widespread

Spots not on margin

Blonde ray a large-bodied species, late maturing, patchy distribution



Spots go to margin

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Some good news…!

✓ Hot off the press…White skate are back in the English Channel! This female was caught at start of August 2013 in a squid fishery single trawl between Brixham and Portland Bill. 110 cm total length

✓ Thornback ray are doing well in the Thames estuary

✓ Are common skate making a comeback?

Courtesy: J. Ashworth

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Current Advice and Management

"Skates and rays fisheries are currently managed under a generic, multi-species TAC, along with prohibitions for severely depleted species, although this complex comprises species that may have different vulnerabilities to exploitation."

"TAC advice is based on the status of the main commercial species, with species-specific advice also provided on an individual basis."

ICES 2012b

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Future of Management

There are several potential management options for skates, including input (effort) and output (catch) controls and technical measures.

Input Controls:

- licensing schemes
- spatial / temporal effort control managment
- effort regulation through restrictions on number of hooks, soak time, gillnet length or hours trawled (also improves discard survival).

Issues:

- economic consequences of reducing effort
- ability to enforce such regulations are unclear.
- advice based on effort should be based on relationships between effort and fishing mortality, and requires reliable datasets of effort.

Output Controls

- single species TAC
- multi-species TAC

"Management measures such as closed areas/seasons or effort restrictions may better protect demersal elasmobranchs"

"In particular, measures to protect spawning/nursery grounds would be beneficial, as well as measures to protect the spawning component of the population (e.g. maximum landing size)."

(*ICES 2012b* ***)***

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Single Species TAC?

"ICES does not advise that individual TACs be established for each species, at present. ICES considers the generic TAC, at best, as an ineffective measure, regulating overall outtake from the assemblage."

However "In some cases, single-species TACs may be appropriate, especially for easily identified species, and/or discrete stocks in limited distribution areas".

ICES 2012b

So what's wrong with a single species TAC option?

- time series of species specific landings is too short for TAC by area and species
- the catch statistics for individual species are not reliable.

Genus (or specific landings) is possible scientifically (also proposed by NWWRAC)

Quota (re-)allocation possibly a bigger hurdle (between and within member states)

Since the last meeting….

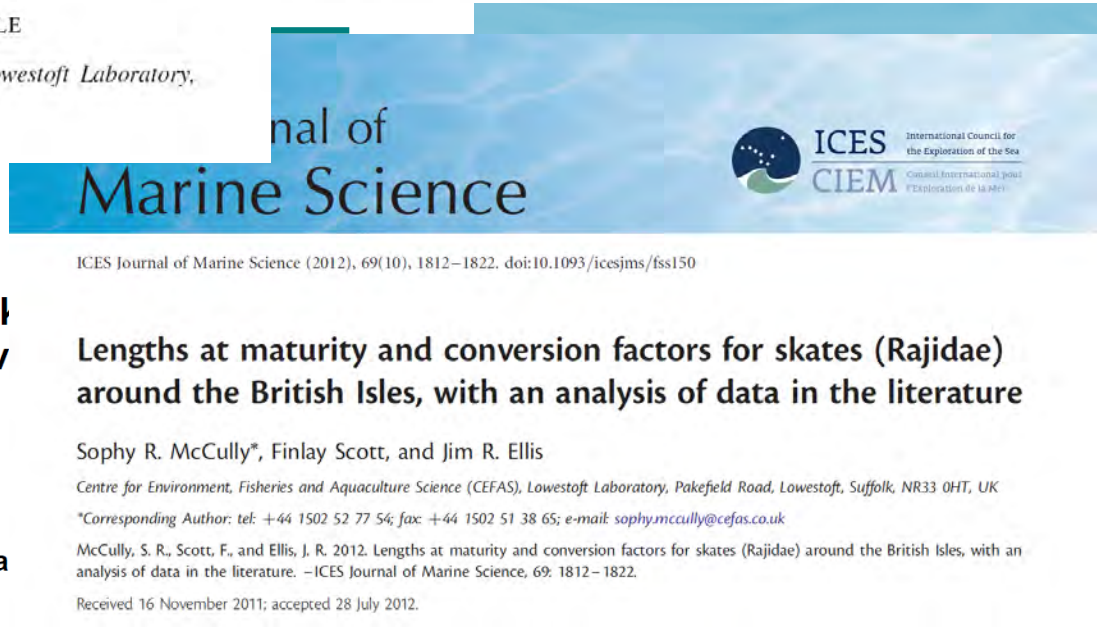
Final Report

***Programme 35:* Monitoring Thornback**
Assessing Stock Lev

Prepared by:

S. R. McCully, G. J. Burt, J. F. Silva a

Cefas – Lowestoft



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SCRS/2012/079

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PRODUCTIVITY AND SUSCEPTIBILITY ANALYSIS: APPLICATION AND SUITABILITY FOR DATA POOR ASSESSMENT OF UK ELASMOBRANCHS.

Sophy R. McCully[1], Finlay Scott[1], Jim R. Ellis[1], Gral

Journal of the Marine Biological Association of the United Kingdom, 2011, 91(6), 1185–1192. © Marine Biological Association of the United Kingdom, 2010
doi:10.1017/S0025315410001906

Preliminary observations on the life history and movements of skates (Rajidae) around the Island of Jersey, western English Channel

J.R. ELLIS[1], G. MOREL[2], G. BURT[1] AND S. BOSSY[2]

Fisheries Science Partnership: 2011–2012

Spurdog, Porbeagle and Common Skate Bycatch and Discard Reduction Final Report (May 2012)

By: Victoria Bendall, Stuart Hetherington, Jim Ellis, Samantha Smith, Mark Ives, James Gregson and Ainsley Riley (Cefas, Lowestoft)

ICES CM 2010/E:10

UK fisheries for skates (Rajidae): History and development of the fishery, recent management actions and survivorship of discards

J.R. Ellis, J.F. Silva, S.R. McCully, M. Evans and T. Catchpole

PROCEEDINGS
AL B
Proc. R. Soc. B (2010) 277, 1497–1503
doi:10.1098/rspb.2009.2111
Published online 27 January 2010

Molecular markers reveal spatially segregated cryptic species in a critically endangered fish, the common skate (*Dipturus batis*)

ndrew M. Griffiths[1,*], David W. Sims[1,2], Stephen P. Cotterell[1,2], Aliya El Nagar[1], Jim R. Ellis[3], Arve Lynghammar[4], Matthew McHugh[1], Francis C. Neat[5], Nicolas G. Pade[1,6], Nuno Queiroz[1,7], Bárbara Serra-Pereira[8], Toby Rapp[9], Victoria J. Wearmouth[1] and Martin J. Genner[1,10]

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